<center>Remarks</center>

Applicants have amended claims 5-8, 11, 12 and 14 in accordance with the Examiner's suggestions in order to correct typographical errors and improper claim form. Accordingly, the amendments to claims 5-8, 11, 12 and 14 were not made in order to address issues of patentability and Applicant respectfully reserves all rights under the Doctrine of Equivalents. No new matter has been added, and no new material presented that would necessitate an additional search on the part of the Examiner.

Upon entry of this Response, claims 1-15 remain pending.

Objections

Drawings

Figures 3 and 4 were objected to as depicting block diagrams without "readily identifiable" descriptors of each block, as required by 37 C.F.R. 1.84(n). According to the Examiner, the blocks of Figures 3 and 4 are not readily identifiable *per se*.

In response, Applicants submit herewith a Replacement Drawing Sheet in which Figures 3 and 4 have been amended to provide readily identifiable descriptors in accordance with the Examiner's suggestions.

Claims

Claims 5 and 6 were objected to as containing typographical errors.

In response, Applicants have amended these claims to correct the typographical errors identified by the examiner.

Claims 7-14 were also objected to as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim.

In response, Applicants have amended the claims to eliminate instances of multiple dependent claims depending from other multiple depended claims.

In view of the above, Applicants respectfully request withdrawal of the Examiner's objections to the drawings and claims.

35 U.S.C. § 102 Rejections

§102(e)

Claims 1, 2 and 15 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Published Application No. 2002/0133070 ("Huang"). Applicants respectfully traverse.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Manual of Patent Examining Procedure* § 2131 (8th ed., Rev. 4, Oct. 2005), citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q. 2d 1051, 1053 (Fed. Cir. 1987). Thus, the standard for rejection under 35 U.S.C. § 102 is identity. Factual analysis below shows that Huang is not the same as the subject matter of the Applicants' claimed invention.

Huang discloses a method for performing Magnetic Resonance Angiography (MRA) using contrast agents to enhance the NMR signals. The method and system of Huang produces a 2D projection image from a 3D image data set from which a 3D mask image is subtracted. (Huang at Para. 14). Huang does not disclose or otherwise suggest Applicants' image processing system which is capable of automatic adaptation of a 3-D mesh model onto the surface of an object in a medical image.

The Examiner alleges that paragraph 1 of Huang discloses an image processing system having an image data processing means of automatic adaptation of 3D surface model to image features, for model based segmentation. Applicants respectfully disagree. Specifically, Huang does not disclose or otherwise suggest the use of a 3-D mesh model, let alone a means of automatic adaptation of this model to image features. The image segmentation method of Applicants' invention is based on utilization of discrete deformable models, e.g., Simplex Mesh Models. Huang does not disclose or otherwise suggest use of deformable models. Rather, Huang discloses obtaining a 2D MRI image by: (1) injecting contrast agent into a subject; (2) obtaining a 3D image of vasculature of interest; (3) moving the subject to a new imaging station and acquiring a mask image of the vasculature of interest; (3) injecting more contrast agent into the subject; (4) acquiring another 3D image of vasculature of interest; and (5) producing the 2D image by subtracting the 3D mask image from the contrast image data set and MIP projection of the resulting 3D difference image.

Further, the teaching of Huang does not disclose or otherwise suggest any of the steps of image processing of Applicants claimed invention. Specifically, Huang does not disclose generation of a simplex mesh model. Huang also does not disclose segmentation of the 3D digital images in accordance with the mesh model. Huang likewise does not disclose estimation of the fitness of the mapping operation, or refining the fitness of the matching between the mesh model and the object of reference. In short, Huang discloses a method wholly different and unrelated to Applicants' invention.

The legal standard for rejection under 35 U.S.C. §102 is identity. As shown above, Huang is not the same as the subject matter of Applicants' claimed invention (e.g., claim 1). Claim 2 of Applicants claimed invention depends from claim 1, and include all the limitations of claim 1. Thus, Huang also does not anticipate claim 2.

As discussed with respect to claim 1, Huang also does not teach or otherwise suggest the element of acquiring image data of 3D image with image features, and automatically adapting 3D surface model to image features, for model-based image segmentation as provided in claim 15. Accordingly, Huang fails to anticipate claim 15.

Accordingly, Applicants respectfully assert that Claims 1, 2 and 15 are novel in view of Huang, and respectfully request withdrawal of the Examiner's rejection under 35 U.S.C. §102(e).

§102(b)

Claims 1, 2, 6 and 15 were also rejected under 35 U.S.C. § 102(b) as anticipated by Delingette, H., General Object Reconstruction Based on Simplex Meshes, *International Journal of Computer Vision*, 32(2): 111-146 (1999) ("Delingette"). Applicants respectfully traverse.

Delingette discloses a general tridimensional reconstruction algorithm of range and volumetric images which is based on deformable simplex meshes. Dilingette fails to disclose or otherwise suggest the image processing system of Applicants' claimed invention. The Examiner has cited the fact that Delingette discloses a DEC Alphastation 200/233 (Delingette at p. 137). However, this workstation was used to evaluate computation times with respect to the stages of deformation (Delingette at 137-138). Delingette nowhere discloses or suggests a complete system for processing medical image data as provided by Applicants' invention (e.g., claims 1 and 15). Further, Delingette nowhere discloses or suggests a means for dynamic adaptation of the model resolution to image features including means of locally setting higher resolution when

reliable image features are found and means of setting lower resolution in the opposite case (e.g., claims 1 and 15) The portion of Delingette cited by the Examiner concerns mesh transformation, noting that meshes can be locally refined or decimated. Delingette does not disclose or suggest estimating a confidence parameter value of given cells of the mesh model or setting higher resolution when reliable image features are found and setting lower resolution when unreliable image features are found.

The legal standard for rejection under 35 U.S.C. §102 is identity. As shown above, Delingette is not the same as the subject matter of Applicants' claimed invention (e.g., claims 1 and 15). Claims 2 and 6 of Applicants claimed invention depend directly or indirectly from claim 1, and include all the limitations of claim 1. Thus, Delingette also does not anticipate claims 2 or 6.

Accordingly, Applicants respectfully assert that Claims 1, 2 and 15 are novel in view of Delingette, and respectfully request withdrawal of the Examiner's rejection under 35 U.S.C. §102(e).

<u>35 U.S.C. § 103(a) Rejections</u>

Claims 3, 4 and 6 were rejected under 35 U.S.C. 103(a) as being obvious over Delingette and U.S. Patent 6,968,299 ("Bernardini") in view of Parker and U.S. Patent 6,335,943 (Lorraine). Applicants respectfully traverse.

According to a summary of criteria in the *Manual of Patent Examining Procedure,* "[t]o establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest <u>all the claim limitations</u>. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure." [emphasis added] *Manual of Patent Examining Procedure* §2142 (8th Ed. Rev.2, May 2, 2004); *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants respectfully traverse the above rejection, and show that the facts of the case and the relevant case law indicate that the invention would not have been obvious to one of

ordinary skill in the art at the time the application was filed because the underlying facts show that the criteria for a *prima facie* rejection have not been met. Applicants specifically note that claims 3, 4 and 6 all depend either directly or indirectly from claim 1 and, thus, include all of the limitations of claim 1.

Applicants have shown above that Delingette does not teach or suggest the Applicants' claimed invention. Specifically, Delingette does not teach or suggest the image processing system of Applicants' claimed invention, i.e., a complete system for processing medical image data. Moreover as shown above, Delingette also fails to disclose or otherwise suggest a means for dynamic adaptation of the model resolution to image features including means of locally setting higher resolution when reliable image features are found and means of setting lower resolution in the opposite case. Bernardini discloses a ball-pivoting algorithm for finding a triangle mesh that interpolates a set of points obtained from a scanning system. Bernadini does not remedy the deficiencies of Delingette.

Accordingly, by the legal criteria discussed above, and by the underlying facts of the content of the cited prior art and of the present pending claims, it is clear that the combination of Delingette and Bernardini fails to teach or suggest all the limitations of any of claims 3, 4 and 6 of Applicants' invention. Thus, a *prima facie* case has not been made that Applicants' invention is obvious.

Further, Bernardini does not teach or suggest modifying the method of Delingette to arrive at the apparatus and methods of Applicants present invention.

Therefore, a *prima facie* case that Claim 3 as here amended is obvious has not been made.

Accordingly, Applicants respectfully request withdrawal of rejection of claims 3, 4 and 6 under 35 U.S.C. §103(a).

Summary

In view of the foregoing amendments and remarks, Applicant respectfully submits that the pending claims are in condition for allowance, which is respectfully requested.

If there are any questions regarding these remarks, the Examiners are invited and encouraged to contact Applicants' representative at the telephone number provided.

Respectfully submitted,

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